PROCEEDINGS

OF THE

ROYAL SOCIETY OF EDINBURGH.

VOL. II. 1846–7. No. 30.

SIXTY-THIRD SESSION.

Seventh Ordinary Meeting, 1st March 1847.

SIR THOMAS MAKDOUGALL BRISBANE, Bart., President, in the Chair.

The following Communications were read :—

1. On the co-existence of Ovigerous Capsules and Spermatozoa in the same individuals of the Hydra viridis. By Dr Allen Thomson.

In this communication, the author described some observations made by him in the autumn of 1845, by which he had ascertained that in the Common Green Polype, as had previously been observed in the *Hydra fusca*, generation takes place at the approach of winter by the development of impregnated ova.

Professor Thomson ascertained, that, at this season, while a number of the polypes bore the spermatic capsules near the base of the arms, a few animals were to seen, on which, besides these capsules, an ovum was developed from the exterior of the middle of the body.

The act of fecundation was observed : the sub-division of the yolk, while the ovum still remained in its capsule, attached to the parent, was distinguished, as well as the subsequent separation of the ovum ; but the author had not an opportunity of tracing the formation of a young polype from the ovum.

The author was not inclined to regard the process of gemmation, which is the more frequent mode of multiplication in these animals, as explicable on the supposition that the buds are developed from ova that have been previously impregnated, and are retained in the substance of the parent's body.

2. On the Parallel Roads of Lochaber; with Remarks on the change of relative Levels of Sea and Land in Scotland, and on the Detrital Deposits in that Country. Part I. By David Milne, Esq.

The author, after referring to the views of former observers, stated, that though he had proceeded to Glen Roy under a strong impression that Mr Darwin's marine theory afforded a solution of the question, he had felt himself constrained, after an examination of the valleys, to abandon that theory, and that he had satisfied himself that the shelves had been formed by lakes of fresh water. He referred to the proofs still existing of the mode in which these lakes had been discharged, and he described particularly the unequivocal traces of an old river course running from the head of Glen Glaster to Loch Laggan, with a delta at the level of shelf 4 on Loch Laggan side, formed by this ancient but now extinct river.

The author considered that the blockage of the waters in the valleys had been formed of boulder-clay and other ancient detrital matter. There was proof that this detritus had been deposited in the district before the waters had begun to be depressed, as the shelves were, in some places, *indented* on the boulder-clay; and this detrital matter must, when deposited in the valleys, have been in sufficient quantity to have dammed back the waters, as there were still abundant traces of it on the sides of the hills at a higher level than that of any of the shelves.

The author differed from Dr MacCulloch and Sir Thomas Dick Lauder, in supposing that it was necessary to assume the occurrence of an earthquake or any convulsion of nature to account for the breaking down of barriers, by which the lakes were blocked up. He considered that it was an error to assume that the first depression of the lake in Glen Roy was 82 feet, and shewed that there must have been at least three intermediate depressions; and that after the first depression, the water must have flowed out by Glen Glaster into Glen

Spean. He adduced several considerations to shew that the blockage at the west end of Glen Roy could have been nothing else than detritus capable of being worn down and removed by the gradual operation of a stream, and in this manner be accounted for the ultimate removal of all the blockage which had previously dammed back the water in the several valleys marked by shelves.

He next adverted to the theory of Agassiz, that the waters had been blocked up by the moraine of a glacier descending from Ben Nevis;—a theory which, at the best, could not explain the formation of a lake in Glen Gluoy. The author shewed, however, that it would not explain the shelves in Glen Roy; as the two uppermost shelves, stopped short by two miles of the place where the Ben Nevis moraine is said to have been formed, and the lowest shelf went beyond this place by three or four miles.

The following Gentleman was duly elected an Ordinary Fellow:—

James Nicol, Esq.

The following Donations to the Library were announced:—

Medico-Chirurgical Transactions published by the Royal Medical and Chirurgical Society of London. Vol. XXIX.—*By the Society.*

Memoirs of the Wernerian Natural History Society, for the years 1837–8. Vol. VIII., Part 1.—*By the Society.*

The Journal of Agriculture, and the Transactions of the Highland and Agricultural Society of Scotland.—*By the Society.*

Five Geological Memoirs, viz.—

Geological Features of the Mines of Taurus.

On the Gogofan Mine, Cærmarthenshire.

On the Mining Establishment of France.

On Coal and Lignite, and on Iron and Steel manufactured in France.

On the Mining Academies of Saxony and Hungary. By Warington W. Smyth, Esq.—*By the Author.*

Monday, 15*th March* 1847.

RIGHT REV. BISHOP TERROT, V.P., in the Chair.

The following Communications were read:—

1. On the Course of Observation to be pursued in future at the Royal Observatory of Edinburgh. By Professor C. Piazzi Smyth.

Being at present chiefly taken up with the computation of his predecessor's observations, the author takes this opportunity of examining into what is going on in other Observatories; and then endeavours, from the results of such a survey, to select some unpursued branch of Astronomy, as the proper subject to which the Edinburgh Observatory should be devoted; and he dwells much on the great caution to be used, in the present multiplication of astronomical observatories, that several of them be not working against each other on the same subject; and urges the extreme importance of first selecting an appropriate object of research, and then following it up with a constancy enduring through ages, after the manner of the Greenwich Observatory, which has consequently produced results of such inestimable service to the promotion of the science.

He then proceeds to describe the several observatories, and the objects pursued at Greenwich, the Cape of Good Hope, Cambridge, Oxford, Armagh, Durham, and Liverpool; and concludes that they are all doing their work so well, that it would be quite useless for any other establishment to follow in the same paths.

But while the movements of the planets round the sun are so well attended to at Greenwich, he remarks that the question of the motion of the sun itself amongst the stars, is equally important, is peculiarly the business of our age to investigate, is only possible to be solved by public observatories with good meridian instruments, and, being unpursued elsewhere, may well be adopted as the peculiar mission of the Edinburgh Observatory.

The proposed method of solving this problem is then described, and consists generally in procuring accurate places of a great number of stars, for three distinct epochs, during a period of thirty years; constants and fundamental points being taken, for specified reasons, from Greenwich.

The Edinburgh Observatory is not, however, to be wholly engrossed in this long and distant inquiry, but is also to do something immediately useful for amateur astronomers, by fixing the abso-

lute places of all stars which have been used by those gentlemen in differential measurements; the want of some establishment to which private observers might send for the determination of their stars of reference, having long been a matter of regret.

In conclusion, the author alludes to the various foreign observatories, whose subjects of observation will, he thinks, by no means interfere with that selected for Edinburgh; and he congratulates himself that having made his election entirely on independent physical considerations, he has at last arrived at the same point to which his predecessor seemed to be drawing nearer and nearer every year.

2. Observations of Terrestrial Temperature made at Trevandrum Observatory, from May 1842 to December 1845. By John Caldecott, Esq. Communicated by Professor Forbes.

This paper is a continuation of the Register of Observations already recorded at page 29 of this volume of the "Proceedings." The following table contains the mean corrected results of the observations at 3, 6, and 12 French feet, and of the temperature of the air for 1843, 1844, and 1845 taken together:—

	No. 1. 12 feet Thermometer.	No. 2. 6 feet Thermometer.	No. 3. 3 feet Thermometer.	Air Temperature.
January	85·528	85·618	84·954	78·930
February	85·784	86·625	86·838	80·386
March	86·373	88·110	88·789	82·730
April	86·916	88·527*	89·614	83·370
May	.....	88·224†	88·413	81·603
June	86·878†	86·883	85·012	79·023
July	86·537	85·114	83·250	78·450
August	85·894	84·736	83·566	78·990
September	85·633	85·133	84·575	79·973
October	85·680	85·632	84·722	79·076
November	85·651	85·271	84·622	79·750
December	85·607	85·303	84·228	78·030
Means	86·043	86·264	85·715	80·025

* Mean of Two Years only. † Result of 1843 only.

3. On the Temperature of Wells and Springs at Trevandrum in India (Lat. 8° 31′, Long. 5h 8m.) By Major-General Cullen, Madras Artillery. Communicated in a Letter to Professor Forbes.

The tables accompanying this letter include daily observations of three wells and one spring for the greater part of 1842 and 1843. The following is an abstract :—

Abstract of the Depth and Temperature of Wells at Trevandrum for the years 1842–43.

Dates.	Garden Well.		Kitchen Well.		Village Well.		Spring.	Rain.
	Depth from surface of ground 40 feet.		Depth from surface of ground 48 feet.		Depth from surface of ground 36 feet.			
	Mean depth of Water.	Mean Temp.	Mean depth of Water.	Mean Temp.	Mean depth of Water.	Mean Temp.	Mean Temp.	Total.
	Feet.	Degrees.	Feet.	Degrees.	Feet.	Degrees.	Degrees.	Inches.
1841 Dec. .	11⅓	83	15	81	12	82		0·1
1842 Jan. .	9	83	12	81⅓	9	82⅓		3¾
... Feb. .	7	83	9	81	7	82		0⅓
... March	6	84	2⅓	82¾	2⅓	82¾		0¾
... April	5½	84¾	1⅛	83⅛	0⅓	83¼		3½
... May .	6¾	84	2	82¾	2	82¾		13¾
... June .	13¾	83¼	12	82¼	11½	82¾		9½
... July .	8¾	83½	9¾	82¾	7¾	83	86⅓	4¼
... Aug. .	8	83¼	7⅓	83	6	83	86	3¾
... Sept. .	7⅓	83¾	4	82¾	3	83	86	6⅓
... Oct. .	8¼	84	6	83	3¾	83	86	5
... Nov. .	11⅓	82¾	9¾	83	7	82	86	8¾
... Dec. .	12	83¾	12½	82¾	8	82¾	86	0⅓
Mean	9	83½	7	82½	7	82¾	86	59½
1843 Jan. .	6½	84	7½	82½	4½	82½	85⅝	0¾
... Feb. .	4⅓	84¾	2½	82½	0¾	82	85⅝	0
... March	6	85	1½	82¾	0½	82	84⅝	2⅓
... April	7	84¾	1	82¾	0½	82½	85	8¾
... May .	11	84¼	5	83	3¼	83	86	17
... June .	21½	83½	20½	83	16¼	83	86¼	16½
... July .	24¼	83	26½	82¾	20	83	85⅝	13
... Aug. .	15¼	83¾	19½	82	14	83¾	86	2⅓
... Sept. .	10½	84	11⅓	82	7½	83	86	3
... Oct. .	9	84	8	82¾	4	83	86	7⅓
... Nov. .	9	84	5	83	2¾	82¾	86	2
... Dec. .	14¼	83	13¼	82	8⅓	82¾	86	11½
Mean	11½	84	10	82½	7⅙	82¾	85¾	85

The following remarks in Major-General Cullen's letter illustrate some particulars of the observation.

"In a dry season the spring sometimes ceases altogether, but it is very singular, that on its reappearance after a few days' rain, its temperature continues the same nearly as before.

"I had supposed that the temperature of such a spring, as that shewn by Mr Caldecott's ground-thermometers, would have been nearly the mean annual temperature of the atmosphere at the place of observation, but I perceived that his mean annual temperature for Trevandrum is only about 80°; but Colonel Sabine has already pointed out some peculiarities in the meteorology of Trevandrum which may have a wider application than has hitherto been suspected. The early sea breezes which affect the barometer, &c., may not extend their effect below the surface of the ground.

"Even the temperature of the wells is remarkably uniform, though lower than that of the spring. In none does the monthly temperature differ above 1° from the annual. The kitchen and village well are upon the top of a swell, while the garden-well is on a considerably lower level, down a slope half-way down to the spring, and the average depth of water of the garden-well is also greater than the other two. May these differences account for the higher temperature of the garden-well? The depth from the surface of the ground of all the wells was nearly alike, 40, 48, and 36 feet."

4. Chemical Notices. By Professor Gregory.

(1.) *On a Fatty Substance derived from Animal Matter.*

This substance, derived from a pig buried for fifteen years on the side of a hill, was found to consist of free fatty acids, with a mere trace of animal matter, and no appreciable trace of phosphate of lime. The bone earth appears to have been dissolved by the water percolating through the soil.

(2.) *On a Black Powder which appeared on the Surface of Loch Dochart, on the morning of 23d November* 1846.

This powder was found to have the composition of humus in a very advanced state of decay, and was probably derived from peat. It contained 77 per cent. of carbon; and left, when burned, hardly a trace of ashes.

(3.) *On the Preparation of Hippuric Acid.*

The author, after describing this acid, and the interest attached to it, gave an improved, easy, and productive method of preparing it, and exhibited specimens of the acid so prepared.

The process consists in boiling the urine of the horse with lime, and then rapidly boiling down the filtered solution, after which the addition of hydrochloric acid causes a deposit of impure hippuric acid. This is easily purified by a repetition of the process of boiling with lime, &c.

The following Donations to the Library were announced:—

The American Journal of Science and Arts. By Professors Silliman and Dana. Second Series, No. 6, 8vo.—*By the Editors.*

The Quarterly Journal of the Geological Society. No. 9, 8vo.—*By the Society.*

The Journal of the Royal Asiatic Society. No. 17, Part II., 8vo. —*By the Society.*

Resultate des Magnetischen Observatoriums in München während 1843–4–5. Von Dr J. Lamont. 4to.—*By the Author.*

Travaux de la Commission pour fixer les Mésures et les Poids de l'Empire de Russie, redigés par A. Th. Kupffer. 2 vols 4to, 1 vol. folio.—*By the Author.*

Memoires de la Société Géologique de France. Deuxième Serie. Tome II., première Partie.—*By the Society.*

Annuaire Magnétique et Météorologique du Corps des Ingénieurs des Mines de Russie, par A. T. Kupffer. Année 1843, Nos. 1 and 2, 4to.—*By the Russian Government.*

Carte Climatologique de Varsovie, par Albert Jastrzebowski. One Sheet.—*By the Author.*

Monday, 5th April 1847.

SIR THOMAS MAKDOUGALL BRISBANE, Bart., President, in the Chair.

The following Communications were read:—

1. Remarks on the Hypothesis of Progressive Development in the Organic Creation. By Sir G. S. Mackenzie, Bart.

This paper the author considered as nothing else than an abstract of the thoughts he entertained on the subject. His object was to shew there was no analogy in nature, rendering a prospective law

of progressive development from lower to higher types probable; and he brought forward various examples to prove that, in all cases in which variation took place among domestic animals and vegetable productions, the varieties, though they might be regarded as improved or new, were not permanent, but required selection and care to preserve them; so that new forms and qualities appearing, could not confirm the progressive hypothesis.

Referring to what may have been the original condition of things on their being created, that condition, in respect to many, may not have altered, either in improvement or deterioration. It is apparent, however, that special constitutions must have been given originally to those animals and vegetables, more particularly intended for the use of man, which admitted of natural or artificial, but not permanent, variation. Man himself possesses the constitution giving a tendency to vary, so that every individual may be deemed a variety; but no natural progress towards a higher type is apparent. In this case, as well as in portions of inferior creation, though we can compare one being with another, and perceive improvement or deterioration, we have no standard to appeal to for the purpose of examining the extent of variation, one way or the other, from the period of creation downwards to our time. Man, in his best condition, can only aspire to see his race possessed of what he esteems desirable in moral, intellectual, and physical qualities; and may, to no inconsiderable extent, succeed in his endeavour to advance, if he make an effort. Unless, however, it be a sustained one, he will fall back in the scale of humanity, instead of advancing, as daily experience proves. Whoever will look carefully at what is called the progress of civilization, may be convinced that the honoured word is applied too exclusively to the progress of wealth, power, and luxury, rather than to the promotion of the qualities that properly distinguish humanity, and which are found wanting wherever an effort has not been made to elevate the human character by education and moral training. The very idea of education indicates a tendency to deterioration, and the necessity of an effort to counteract it. On the whole, it does not appear that any natural analogy can be found to support the idea of progressive development from lower to higher types. We see no new races appearing, and we find only varieties. The stronger, because cultivated (not newly developed), intellect and energy of Europe are subduing or extirpating the inferior and weaker races in other parts of the world; but the substitution of a better race in this manner is not progressive development.

2. On the Parallel Roads of Lochaber; with Remarks on the change of relative Levels of Sea and Land in Scotland, and on the Detrital Deposits in that Country. Part II. By David Milne, Esq.

The author proceeded to shew that the lake theory of the Lochaber shelves was not inconsistent with any established geological truths, but was on the contrary supported by them.

He alluded to the occurrence in the Lochaber district, as well as in other parts of Scotland, in valleys far from the sea, not only of lakes at high level, but of beach lines on hill-sides precisely analogous to those of Glen Roy, and shewing depressions of water to nearly the same extent. One of the localities referred to is a valley near Inverournan, where three parallel roads are to be seen shewing a depression first, of about 197 feet, secondly, of 94 feet, and lastly, of 184 feet. The blockage required for this ancient lake, and of which a small remnant still exists, was nearly as extensive as that required for Glen Roy.

Other localities were pointed out where parallel roads on hill-sides, similar to those of Lochaber, were to be seen.

In corroboration of the existence of lakes at high levels which no longer exist, reference was made to the existence of River Haughs at considerable heights above the present course of the rivers.

The author proceeded next to shew, that when the rivers ran in these higher channels, the sea stood at a higher level than at present. He, in proof of the former submergence of the land beneath the waters of the ocean, and its gradual emergence from it, referred, 1*st*, to the occurrence of marine remains at considerable heights above high-water mark; 2*d*, to the existence of extensive sand-banks which could have been formed only at the bottom of a deep sea; and, 3*d*, to lines of ancient sea-cliffs and terraces along the coast.

The author alluded next to the nature of the deposits formed, when the land was covered by the sea, and endeavoured to shew, that during this period the boulder-clay had been transported by some great oceanic movement whereby the valleys were filled with detritus. He shewed that the detritus had come from the westward, and, therefore, that valleys situate, like those of Lochaber, on the east side of lofty mountains, would be especially liable to be blocked up by detritus.

Reference was made to a number of boulders resting on beds of

sand and fine gravel in the counties of Nairn and Moray, which appeared to have been floated by ice, at a later period, and as the land was emerging from the sea.

An account was given of a number of phenomena, which apparently were due to the emergence of the land from beneath the waters of the ocean. In particular, an account was given of beds of gravel lying over beds of sand and mud, contrary to the law of specific gravity; of long ridges of gravel and sand generally parallel to the lines of coast, or the direction of valleys, and of old sea-cliffs and sea-terraces at various heights above the sea.

In reference to this last point, the author observed, that there were reasons why geologists should not reject as unworthy of notice, the possibility, that the land may, in some cases, not have been the moving body, but that owing to elevations and depressions in the bed of the ocean, the waters may have advanced or receded, and thus formed the lines of ancient sea-cliffs.

3. Verbal Communication on Fossils of the Lias Formation, from South Africa. By Dr Fleming.

The following Donations to the Library were announced:—

Journal of the Asiatic Society of Bengal, 1846. No. 170.—*By the Society.*

Journal of the Royal Geographical Society of London. Vol. XVI., Part 2.—*By the Society.*

Memoirs of the Literary and Philosophical Society of Manchester. Vol. VII., Part 2.—*By the Society.*

Proceedings of the Royal Irish Academy. Nos. 48 to 53. 8vo.

Transactions of the Royal Irish Academy. Vol. XXI., Part 1.—*By the Academy.*

Monographie Generale de la Famille des Plantaginées, par F. M. Barneoud. 4to.

Monographie des Crucifères du Chili, par F. M. Barneoud. 8vo.

Memoire sur le Developpement de l'Ovule, de l'Embryon et des Corolles Anomales, dans les Renonculacées et les Violariées, par F. M. Barneoud. 8vo.

Memoire sur le Developpement de l'Ovule et de l'Embryon dans le Schizopetalon Walkeri, par F. M. Barneoud. 8vo.—*By the Author.*

Kongl. Vetenskaps-Akademiens Handlingar, for Ar. 1844. 8vo.

Arsberättelse om Framstegen i Kemi och Mineralogi af Jac. Berzelius. 8vo.

Ofversigt af Kongl. Vetenskap-Akademiens Forhandlingar, 1845. 8vo.—*By the Academy.*

Memoiries de l'Academe Royale des Sciences de l'Institut de France. Tome XIX. 4to.

Memoires presentés par divers savants à l'Academie Royale des Sciences de l'Institut de France. Tome IX.—*By the Institute.*

Observations Météorologiques faites à Nijne-Taquilsk. Année 1845. 8vo.

Voyage dans la Russie Meridionale et la Crimée, par la Hongrie, la Valachie et la Moldavie, executé en 1837, sous la direction de M. Anatole de Demidoff. Planches; Liv. 12, fol.—*By the Author.*

Proposed Bridge across the River Clyde for the Glasgow, Paisley, Kilmarnock, and Ayr Railway.

Monday, 19*th April* 1847.

DR CHRISTISON, V.P., in the Chair.

The following Communications were read:—

1. On Certain Products of Decomposition of the Fixed Oils in Contact with Sulphur. By Dr T. Anderson.

The investigations contained in this paper were undertaken with the view of ascertaining the nature of the action of sulphur in the free state on organic substances. The author endeavoured, in the first instance, to examine the action of that agent upon some of the simpler organic compounds, but without obtaining any definite results; and finally confined his experiments entirely to the fixed oils.

The distillation of oil of almonds with sulphur, which is attended by the violent evolution of sulphuretted hydrogen, afforded a peculiar nauseous oil, and a crystalline product deposited on cooling from the latter portions of the oil. In order to ascertain the source of these products, comparative experiments were made with pure stearic and oleic acids. It was thus found, that stearic acid, when distilled with sulphur, gave products identical with those obtained by its sim-

ple distillation, but that oleic acid gave an oily fluid and crystals similar to those produced from the crude oil.

The crystalline matter obtained from oleic acid, was an acid, and possessed all the properties of margaric acid; but being formed in very small quantity, the author, in obtaining it for analysis, made use of almond oil, expressed at a low temperature, which, by a comparative experiment, was found to yield no margaric acid when distilled alone. The analysis of this acid gave the following results, which correspond with those of margaric acid:—

	Experiment.		Calculated.
C_{34} . .	75·27	75·40	75·55
H_{34} . .	12·51	12·66	12·59
O_4 . .	12·22	11·94	11·86
	100·00	100·00	100·00

The silver-salt gave 28·53 and 28·70 per cent. of silver, the calculated results being 28·65, and the analysis of its ether was likewise found to correspond to margaric ether.

The oil which distilled along with this substance, and which possessed a most disgusting odour, was rectified; the product collected in separate portions, and analysed; but without affording concordant results. It was found, however, to contain a substance capable of giving precipitates with corrosive sublimate and bichloride of platinum.

The precipitate obtained by corrosive sublimate was purified by washing with ether and solution in boiling alcohol, from which it is deposited on cooling. It then forms a white pearly powder, which, under the microscope, presents the appearance of tabular crystals. It is insoluble in water and ether, sparingly soluble in alcohol, and rather more so in coal-naphtha. It gave to analysis the following results, corresponding to the formula $C_{16}\ H_{16}\ S_5\ Hg_4\ Cl_2$.

	Experiment.	Calculated.
C_{16} . . .	14·61	14·46
H_{16} . . .	2·72	2·42
S_5	12·48	12·13
Hg_4 . . .	60·01	60·32
Cl_2 . . .	10·67	10·67
	100·49	100·00

The author, from the similarity of the properties of this substance to those of the mercury compound of allyl, considered it to possess an analogous constitution, and to be derived from a substance having the formula $C_8 H_8 S_2$, existing in the oil. According to which view its rational formula may be represented by

$$(C_8 H_8 S_2 + Hg_3 Cl_2) + (C_8 H_8 S_2 + Hg_2 S.)$$

When treated with sulphuretted hydrogen it became black, and an oil was separated, having a peculiar odour, and giving precipitates with corrosive sublimate and chloride of platinum. This the author considers to be the compound $C_8 H_8 S_2$; but he was unable to obtain enough for analysis.

The precipitate with bichloride of platinum is yellow, insoluble in water, and sparingly soluble in alcohol and ether. By hydrosulphuret of ammonia it is converted into a brown powder.

The oil from which these substances were separated likewise contained sulphur; but the author had not yet proceeded with its investigation.

2. On the structural relation of Oil and Albumen in the Animal Economy. By Dr J. H. Bennett.

Nitrogenised principles of food are subservient to the formation of albumen, whilst the non-nitrogenised are mostly converted into fat or oil. The fact, that a union of these is essential to nutrition, is explained, according to the chemist, by supposing that albumen constitutes the basis of the tissues, and that oil furnishes the elements of respiration and animal heat. This theory, however, does not explain the origin and maintenance of all growth, which is so essential to the vital functions. The author considered that the necessity of oil and albumen was accounted for by their being both necessary to the formation of the tissues, and he endeavoured to shew that there is no elementary cell into which these principles do not enter as constituent parts.

Dr Ascherson of Berlin shewed, in 1838, that oil could not come in contact with fluid albumen, without the formation of a membrane, and that, on producing an emulsion by rubbing them together, cells were formed composed of an albuminous membrane inclosing oil, which were identical with those found in milk. That the milk globules

were not loose particles of oil, the author considered to be proved by the following facts:—1*st*, They float in a fluid, roll freely over each other, and do not unite. 2*dly*, They possess the property of endosmosis and exosmosis. 3*dly*, An excess of ether dissolves them, leaving behind a molecular mass. 4*thly*, Acetic acid dissolves the albuminous envelope, leaving the oil unaffected, when the globules are easily made to unite. 5*thly*, Mechanical means are necessary to extract the butter from milk in the dairy; the act of churning lacerates the minute envelopes. The author obtained the same results with the globules formed artificially by the union of oil and albumen. On mixing oil with other glutinous substances, however, such as gelatine, gum, and syrup, he could not obtain the haptogen membrane of Ascherson, and he found that the mechanical globules so formed, readily united together when at rest. That a delicate albuminous membrane possesses the property of rolling up and uniting its edges so as to form shut sacs, the author has demonstrated, by lacerating nerve tubes, which may then be seen under the microscope to form globules with double lines. From all these facts it was concluded that the globules of milk, as well as those formed mechanically by the union of oil and albumen, were structures composed of an envelope and contents, and that they were endowed from the moment of their formation with the physical property of endosmosis and exosmosis.

The author then alluded to the elementary molecules, granules, and nuclei found in the blastema of all organised formations, which, he agreed with Ascherson, might be demonstrated to possess a like composition and structure to the globules formerly described. He quoted some recent experiments of Professor Matteucci, which proved that an oily emulsion would pass through a membrane by endosmosis, if the fluid on the other side was slightly alkaline. He noticed also the fact ascertained by Donné, that after the removal of the globules from milk, the remaining fluid contained fat in solution. He thought there would be no difficulty now in recognising that the action of the stomach and intestines was directed to the formation of an emulsion of oil and albumen, which, on passing through the intestinal walls, constituted the basis of chyle, and that the property of endosmosis and exosmosis must be in continual operation in elementary molecules, nuclei, and cells.

The structures found in milk, or produced mechanically by the nion of oil and albumen, are not vital structures, but when formed

in the animal body under certain conditions, they become so. The physical relations pointed out are only necessary preliminary steps for the addition of that unknown force called vitality, which directs the ultimate forms these structures assume. They are a *sine qua non*, without which vitality cannot be called into existence. The author thought that these facts, without being capable of explaining the mystery which envelopes the assimilation of organic into organised matter, will constitute another link to the chain of physical actions introductory to its accomplishment. This chain he considered might be composed as follows:—1*st*, Introduction into the stomach and alimentary canal of organic matter. 2*d*, Transformation of this by the *chemical* process of digestion into albuminous and oily compounds. 3*d*, The *physical* imbibition of these, and their union to form elementary granules and cells in the villi and lacteals; and, lastly, the *vital* transformation of these into blood. We observe the same order of changes when exudation takes place from the blood; viz., 1*st*, Exudation of liquor sanguinis, containing oil and albumen in solution. 2*d*, The *mechanical* union of these to form elementary granules and nuclei; and, 3*d*, The vital transformation of these into various tissues.

The author then proceeded to point out various conditions of the animal economy in which the healthy relations of the oily and albuminous principles were more or less deranged.

Sometimes we have general or local collections of fatty matter as in obesity; fatty degeneration of the liver, kidney, and muscles; fatty tumours and the compound granular corpuscles so common in inflammatory softenings, which he considered evidences of local fatty collections. In the same manner we have excessive leanness, and alterations known as cicatrices, indurations, strictures, and fibrous tumours, which are local accumulations of the albuminous compounds. To this class also belong tubercular deposits. The excess of one of these in a tissue leads to atrophy of the other; thus in fatty liver we have excess of the cellular and diminution of the fibrous element, whilst the contrary is the case in cirrhosis. The emunctory organs of these two principles are exposed to like alterations from excess of fat or albumen, and those principles themselves give rise to crystallized products, viz., cholesterine and uric acid, causing obstructive diseases.

Inflammatory diseases in healthy persons give rise to an exudation containing corpuscles, with nuclei and cell walls composed of oil

and albumen in certain proportions. These diminish in organisable power as the exudation abounds in albumen or becomes tubercular, and assume an excessive growth and power of reproduction, as it abounds in the oily element, as in soft cancer. Tubercle is generally found in organs destitute of fat, such as the lungs and fibrous membranes, whilst it is rare in fatty organs, such as the brain and liver. On the other hand, cancer is most common in fatty organs, such as the mamma and liver, and is exceedingly rare in the lungs and fibrous tissues. Again tubercle is common in the young, in whom assimilation rarely produces an excess of fat; whereas cancer is most frequent in advanced life, when obesity and fatty accumulations are especially apt to occur. The importance of these facts in regulating the diet of animals, and in a system of therapeutics, must be evident.

3. Experiments on the Ordinary Refraction of Light, by Iceland Spar. By W. Swan, Esq. Communicated by Professor Kelland.

The following Gentlemen were duly elected Ordinary Fellows:—

W. Macdonald Macdonald, Esq., of St Martins.
Robert Handyside, Esq., Advocate.
Alexander Christie, Esq., Surgeon, H. E. I. C. Service.

The following Donations to the Library were announced:—

On the Silurian Rocks of Parts of Sweden. By Sir R. I. Murchison, F.R.S.—*By the Author.*

A Brief Review of the Classification of the Sedimentary Rocks of Cornwall. By Sir R. I. Murchison.—*By the Author.*

Address delivered at the opening of the New Hall of the Royal College of Physicians, Nov. 27, 1846. By William Beilby, M.D., President.—*By the Royal College of Physicians.*

Journal of the Royal Asiatic Society. Vol. X., Part 2.—*By the Society.*

Comptes Rendus Hebdomadaires des Séances de l'Academie des Sciences. Tome XXII., No. 12, to tome XXIV., No. 10.—*By the Academy.*

On the Polarization of the Atmosphere (from Johnston's Physical Atlas). With a Plate, one leaf folio.—*By the Author.*

Drawing Illustrative of a Geological Section on the Caledonian Railway, 2 miles from Edinburgh. By Sir G. S. Mackenzie, Bart.

Monday, May 3, 1847.

VERY REV. PRINCIPAL LEE, V.P., in the Chair.

The following Communications were read :—

1. On the Boulder Formation and Superficial Deposits of Nova Scotia. By J. W. Dawson, Esq. Communicated by Dr Gregory.

In this paper the author, describes 1*st*, the geological position of the gypsum deposits. The gypsum beds of Nova Scotia all belong to the carboniferous system. No gypsum occurs in older formations, and in the overlying new red, only slender veins and small nodules are found. The gypsum characterises the lower members of the carboniferous series, underlying the productive coal measures. The associated rocks are red sandstones and clays, with very few fossil plants, and thick beds of limestone abounding in marine shells. In the only well ascertained instance of gypsum occurring above the coal measures, it is accompanied by limestone with some of the same shells. The gypsum forms regular conformable beds sometimes 100 feet thick. They are much fractured and difficult to trace from the wooded state of the country; but one thick bed was traced by the author for ten miles.

The beds or gypsum often rest on, or are overlaid by, limestone, and these rocks sometimes pass into one another, as at Ogden's Point and Wallace Harbour. In other cases the gypsum is embedded in marly sands and clays, or in reddish grey and purple sandstone; but limestone is never far distant in ascending or descending order.

2*d*, Its characters. The gypsum is remarkably pure and usually white. This purity, according to the author, indicates its chemical origin, as distinguished from the detrital character of the associated beds. It is also highly crystalline, being often large grained and distinct; but usually lamellar; the plates of selenite having occasionally a stellar arrangement. The beds rarely exhibit a fibrous structure, which is chiefly seen in the narrow veins; but they often shew a laminated structure, parallel to the beds.

3*d*, The foreign matters contained in the gypsum. These are, 1, grains of quartzose sand; 2, coaly or bituminous matter. Near the mouth of the Shubenacadie is a bed of black gypsum, included in red sandstone, without a trace of bitumen; 3, crystals and fragments of carbonate of lime, and small grains of magnesian limestone; 4, red oxide of iron, especially in the veins; 5, anhydrite.

The anhydrite is usually associated with the common variety,

sometimes forming thick beds, and large rounded masses. It is white or grey, and crystalline, lamellar, or granular. It contains occasionally bituminous matter. It does not occur in veins, but is traversed by veins of gypsum.

The gypsum beds are entirely destitute of fossils.

Many salt springs rise from the lower carboniferous and gypsiferous rocks, but rock-salt has not been discovered,

The lower carboniferous limestones are usually filled with shells and corals; but there are some limestone beds which are granular and crystalline without fossils. These beds agree with those of gypsum in their structure, and in containing bituminous matter.

4*th*, The origin of the gypsum. The author concludes by stating his opinion, that the gypsum beds cannot have been formed *in situ*; but that they may have originated from the action of sulphuric acid, conveyed by the rivers into estuaries of small extent, the waters of which, from the abundance of marine fossils, must have been rich in carbonate of lime. The acid may, he thinks, have been derived from the oxidation of iron pyrites, which is very abundant in the older formations. That free acid may have been present, he considers probable, from the blanched appearance of certain sands and clays adjoining the beds, while the neighbouring beds are strongly coloured by iron. Moreover, as might be expected, on the hypothesis of the decomposition of pyrites, oxide of iron is very abundant, both colouring the rocks very strongly, and in the form of large beds of brown hematite. The oxidation of the pyrites may have been promoted by internal heat, of the action of which on the older rocks there is abundant proof. There is also good evidence that the beds of gypsum were deposited in trough-shaped hollows of small extent; and if we suppose the supply of acid to be intermittent, this would account for the alternation of beds of gypsum, and of shell limestone.

The author considers the regular bedding of the anhydrite and its association with unaltered rocks, to preclude the idea of its being gypsum altered by heat *in situ*; and thinks it may have been first altered by heat, and subsequently deposited at the bottom of the sea, although its great purity is not favourable to this hypothesis.

There was exhibited, in illustration of this paper, a large collection of specimens, presented by the author to the Society.

2. On the mode of occurrence of Gypsum in Nova Scotia, and on its probable origin. By the Same.

In this paper, the author, after a general description of the geolo-

gical character of the country, describes the superficial deposits which he divides into—

1. *The unstratified drift or boulder formation.* This, the lower of the two superficial deposits, is characterised by the circumstance, that most of the materials have been derived from the rocks on which they now rest, or those in the vicinity. The fragments are angular, and altogether devoid of any regular arrangement. This unstratified drift, however, does contain boulders from distant localities, which may generally be traced. The appearances indicate that the materials have been transported from the northward, and also, to a less extent, from the southward, and, indeed, in various directions.

Polished and scratched surfaces have been observed only in a few localities; but do not indicate a uniform direction.

2. *Stratified sand and gravel.* This deposit generally rests on the former. Sections were exhibited shewing this in two localities. The pebbles of this gravel are comparatively small. It often forms mounds of singularly regular form, resembling works of art.

After minutely describing various localities, the author proceeds to say that the facts indicate more than one cause of change. 1*st*, He is disposed to consider the contour of the surface on which these deposits rest as the result of powerful submarine currents, occurring probably during the gradual rise of the land. 2*d*, He considers the unassociated state of the unstratified drift, and the small amount of attrition it has undergone as proofs of subaerial disintegration, possibly effected by the frost and thaws of an extreme climate. 3*d*, The great confusion of the fragments, and the presence of foreign boulders indicates, he thinks, a subsequent period of submergence, and the agency of icebergs, transporting these boulders in various directions. Lastly, the mounds and ridges of stratified gravel may have been formed during this period of submergence, or during the gradual rise of the land.

The agencies which have produced these deposits have played a very important part in preparing the surface of the country for agricultural operations; and this is possibly one of the principal uses which these deposits have been intended to serve.

3. On certain Anomalous Deviations of the Transit Instrument at the Royal Observatory. By Professor C. P. Smyth.

Professor Henderson had found a connection between the changes in the level of the transit axis and the readings of a thermometer

which he conceived to shew the temperature of the surface of the rock outside the Observatory; and was accustomed latterly to determine the level error of the axis merely from the indications of the thermometer.

The author has found from Professor Henderson's own observations, a temperature effect on the azimuthal position of the axis four times as strong as in the case of the level.

Indeed the extent was so great as almost to vitiate the observations; for the amount of error varied regularly to such an extent from day to day, as to preclude the possibility of employing the only unexceptionable method of determining the azimuth of the instrument: viz. three consecutive observations of a star above and below the pole.

In order to try to ascertain how heat produced this effect, or what were the parts acted on, six different thermometers were discussed. Five (Professor Forbes's) had their bulbs buried in the rocks 50 feet outside the Observatory, at the depths of 24, 12, 6, 3, and 0· French feet respectively; the last having its bulb merely covered with sand; a sixth thermometer had been observed under the floor of the Observatory, and its indications came between the 0· and the 3 feet instruments.

The deeper the thermometers, the greater was found their difference from the azimuthal errors of the transit; the test consisting in the prominence and similarity of the daily variations, and the degree of retardation of the grand annual wane of heat.

Of the former it was difficult to get a numerical estimate, but of the latter a result was obtained shewing the ratio of the quantity of heat in the first half of the year, to that in the last:—

In the case of the		3 feet Thermometer, the ratio was	1 : 1·941
...	...	Thermometer under floor, .	1 : 1·639
...	...	0· feet, ...	1 : 1·351
...	...	Instrumental errors of Transit,	1 : 1·158

plainly shewing that the parts acted on by temperature were more quickly affected by it than a thin coat of sand, and so could neither be the rocky foundations of the piers, or the massive stone piers themselves; but must be, considering too the effect of the walls and roof covering the instrument, something very small, and most probably metallic.

The field of inquiry being thus curtailed, the brass supports of the axis on the top of the stone piers were examined, and the cause was

then supposed to be discovered in a bad principle in the mode in which the adjustment for level was contrived.

The *experimentum crucis* which the author proposes, is to do away with the adjustable bearings, and have plain simple blocks of brass in their stead, trusting to calculations and not to screws for correcting the instrument. But, as the adoption of this proof will take up a long period, he, in the meanwhile, shews, that this cause which he thinks to have discovered is a *vera causa*, is *sufficient*, so far as the quantity is concerned, and is agreeable as to the direction in which it would act: and as a farther test that the disturbing cause is something near the instrument, and not the rocks outside, the readings of the thermometer attached to the barometer, and the outer thermometer read off during the mural circle observations were discussed, and gave the following highly confirmatory results:—

Barometer-thermometer, first half of year: second half: : 1 : 1·220
Outer ..... −1 : 1 : 114

4. Results of Makerstoun Observations No. III. On the Solar and Lunar periods of the Magnetic Declination. By J. A. Broun, Esq. Communicated by Sir T. M. Brisbane, Bart.

The absolute westerly declination at Makerstoun, for the mean epoch, June 1844 = 25° 17′·12.

The annual motion of the north end of the needle towards the east = 5′·67.

The annual period of magnetic declination consists of a double oscillation, having nearly the following epochs of maxima and minima.*

A max. Jan. 30. The min. Ap. 30. The max. Sep. 10. A min. Dec. 10.

The author examines Cassini's observations (1783–7). Although they confirm this law to some extent, it is not conceived that they can be trusted for such a determination. The author also verifies his result by grouping a large mass of modern observations. The observations at Washington and Toronto, with other facts, prove that the oscillation is inverted, when the secular motion of the needle has an opposite sign, and Colonel Beaufoy's observations (1817–20) seem to prove, that when the secular motion is zero, the annual period is

* By maximum is always meant an extreme *westerly* position of the north end of the needle, and by minimum an extreme easterly (or rather northerly) position.

a combination of the oscillations for a positive and negative secular motion.

The mean range of the annual period at Makerstoun is 0′·96.

The variation with reference to the *moon's age*, consists of

A principal maximum 2 days after full moon.
A principal minimum 2 days after new moon.

with two secondary maxima and two secondary minima, which are exhibited with considerable regularity in each of the results for 4 years. The range of the mean = 0′·83.

The variations with reference to the *moon's declination* and distance from the earth are less distinct for evident reasons. The former seems to consist of

The maximum about the time of the moon's greatest N. declination.
Minima ..... when the moon is on the equator.
A secondary maximum ..... of the moon's greatest S′ declination.

Diurnal periods. 1. *The Sun's hour angles.* In the mean of two years observations (1844–5), the north end of the needle moves nearly 8′ towards the west from 6^h 10 A.M. till 45^m past noon, and as much to the east from the latter epoch till 11^h P.M.; from 11^h P.M. till 2^h 35 A.M., the north end of the needle moves 0′·7 towards the west, returning to the east again about as much by 6^h A.M. The epoch of the greatest westerly declination seems to be connected with its annual period, or with the value of the *mean* westerly declination, and the epoch of the principal mininum, with the sign of the secular change. The author considers that the diurnal oscillation is double at all seasons of the year.

2. *The Moon's hour angles.* The following are the result.

Moon in opposition north of the equator; mean of 13 lunations; oscillation single; range = 0′·8.

Maximum 1^h before inferior transit. Minimum 4^h or 5^h before superior transit.

Moon in opposition south of the equator; mean of 12 lunations; oscillation double; range = 0′·6.

Maximum $2\frac{1}{2}^h$, and minimum 6^h after superior transit. Secondary maximum at inferior transit. Minimum 5^h after it.

Moon in opposition northward, south of equator; mean of 25 lunations; oscillation double; range = 0′·6.

Secondary maximum $4\frac{1}{2}^h$, and minimum 8^h after superior transit. Maximum at superior transit, minimum 6^h after it.

Single lunations verify these epochs very nearly.

3. Notice of two Ores of Copper, one of them a new Mineral. By Professor Connell.

The first of the two ores here described, found in Cornwall, is a new combination of chloride of copper, sulphate of copper, and water. It occurs in beautiful small deep blue acicular crystals, of high lustre, grouped in bundles. The quantity was too small for a quantitative analysis.

The other is essentially a double carbonate of zinc and copper. It is from Matlock. It is pale-green, with a laminated structure and pearly lustre. In the qualitative examination of it, the author observed indications of one, or even of more than one, metallic oxide, which he could not identify satisfactorily with any known substance. This oxide was found to adhere to the copper, when that metal was precipitated by sulphuretted hydrogen. When the sulphuret was dissolved in aqua regia, and precipitated at a boiling heat by potash, the new oxide remained dissolved in the alkali, and the solution yielded on evaporation a small quantity of a soluble salt of a beautiful orange-yellow colour. The solution of this salt, when acidulated, gave, with sulphuretted hydrogen, a red-brown precipitate, which, when dry, was insoluble in muriatic acid, but soluble in aqua regia. On comparison with other known oxides yielding yellow compounds with bases, it appeared to differ from all; but the author had so minute a quantity to operate on, that he cannot pronounce decidedly till he has made further investigation.

The analysis of 3·16 grains of the mineral gave for 100 parts,

Carbonic acid and water,	27·5
Oxide of copper,	32·5
Oxide of zinc,	42·7
Magnesia,	Trace
Lime,	Trace
	102·7

This might give the formula, $\left(\left.\frac{Cu}{Zn}\right\} O\right)^2 C O_2 + H O$, that is, 1 atom of dicarbonate of copper aud zinc, combined with 1 atom of water, which gives 27·9 per cent. of carbonic acid and water together; but the smallness of the quantity analysed, prevented the determination of the relative proportions of carbonic acid and water.